

## December 2015 Regional Climate Summary For the San Francisco Bay Area and Monterey Bay Area

**December 2014 was a month of active weather**, including several precipitation events, a few high surf events, and a couple of cold snaps. However, monthly averages for both precipitation and temperatures ended up close to normal at most climate stations.

The first storm system of the month began to spread rain into the San Francisco Bay Area by mid-morning on Thursday, December 3. In advance of this approaching storm, interesting cloud formations were observed near Monterey Bay.



***A distinct line of mid-level clouds above Marina State Beach in advance of an incoming storm system on the morning of December 3, 2015. Photo: Vern Fisher, Monterey Herald.***

Rain totals on December 3 were mostly light, but locally moderate across the North Bay and in the coastal mountains. In the San Francisco Bay Area and Santa Cruz County rain totals generally ranged from 0.25-0.75", except locally less in the valleys and more in the coastal mountains. Some locations in the North Bay Mountains and Santa Cruz Mountains picked up an inch or more. Venado, in northwest Sonoma County, was the wet spot with 2 inches of rain on the 3<sup>rd</sup>. Farther south, across Monterey and San Benito Counties, rain totals were generally less than a tenth of an inch except locally up to a half inch in the Santa Lucia Mountains above Big Sur.

Three days later, on Sunday, December 6, a frontal system generated some decent rain totals in the coastal hills of the North Bay – anywhere from 1 to 3 inches at the higher elevations of Sonoma and Marin Counties. But rain at lower elevations was light, ranging from a tenth to a half inch in the North Bay

Valleys. Rain totals south of the Golden Gate were mostly less than a tenth of an inch. No measurable rain fell from Santa Cruz and San Jose southward.

The first big wave event of December occurred on Monday, December 7 as large long-period swell arrived along the coast. By mid-morning coastal buoys were reporting swell height of around 20 feet.



***A large breaking wave off Carmel Point in Monterey County on the morning of December 7.  
Photo: Steve Anderson***



***A surfer catches a large wave along the Central California Coast on Dec. 7. Photo: Vern Fisher***



On Wednesday, December 9, the Bay Area was in the warm sector ahead of an approaching storm system. The high temperature in San Jose on the 9th was 71 degrees, warm enough to tie a maximum temperature record that dated all the way back to 1893.

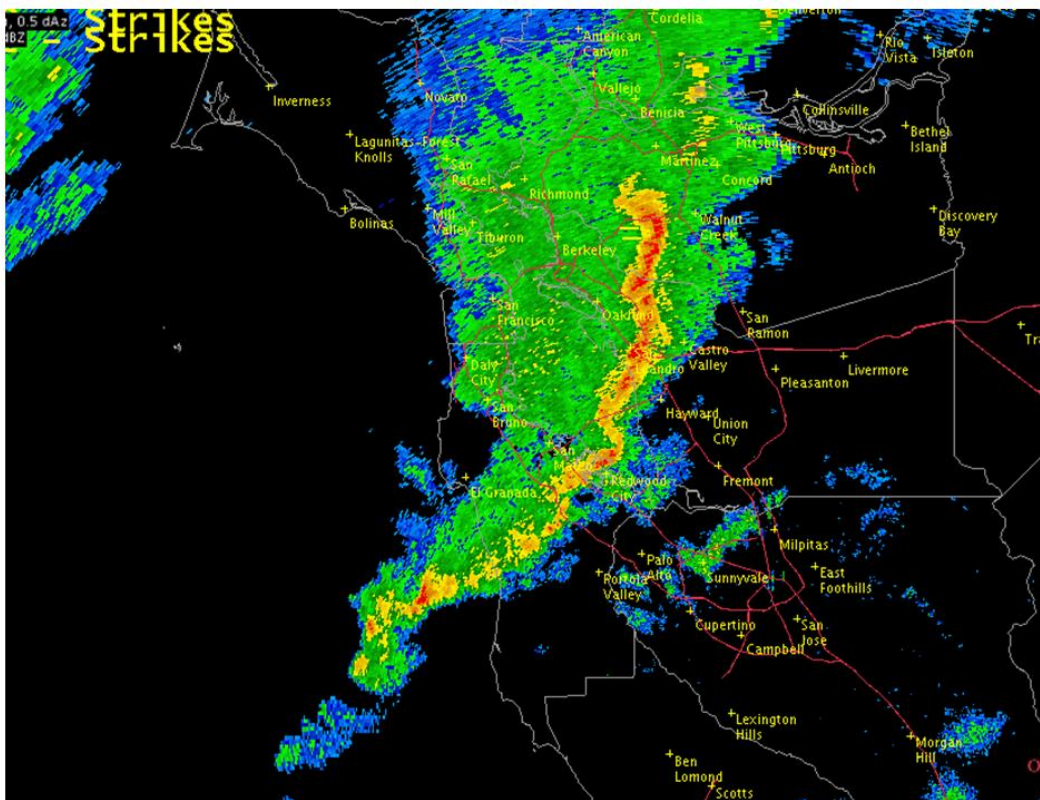
A relatively strong storm system rolled through the region from the night of Wednesday, December 9 through the morning of Friday, December 11. An inch of rain had already fallen on Mount Tamalpais and Mount Saint Helena by midnight on Thursday, December 10. By early that afternoon rain totals were already quite impressive in the North Bay where some of the wetter locations had picked up between 2 and 3 inches of rain.

24 Hour Precipitation Totals (IRIS) - NWS San Francisco			
VENADO 7 NNW	2.96	MIDDLE PEAK RAWS	2.42
2 WSW GUERNEVILLE	2.29	MT.SAINT HELENA	1.97
RIO NIDO	1.91	WOODACRE RAWS	1.63
14 W BROADMOOR	1.60	BEN LOMOND MOUNTAIN	1.57
3 WNW GUERNEVILLE	1.55	GRATON - UPP ROAD	1.50
4 W SAINT HELENA	1.40	GUERNEVILLE	1.40
MONTE RIO	1.33	8 WNW BOULDER CREEK	1.32
RUSSIAN RIDGE OPEN	1.29	FELTON	1.26
PETRIFIED FOREST	1.26	ANGWIN	1.24
SEBASTOPOL - COFFEE LN	1.23	BARNABY RAWS	1.23
OCCIDENTAL- JOY ROAD @	1.23	CAZADERO - HUCKLEBERRY	1.21
ATLAS PEAK RD	1.16	MOUNT DIABLO PEAK	1.15
OLEMA VALLEY RAWS	1.14	UPPER COYOTE CREEK	1.14
ST HELENA @ SULPHUR CK	1.14	BOULDER CREEK	1.14
MT VEEDER	1.14	1 SSE BOULDER CREEK	1.06
ANDERSON PEAK	1.03	SEBASTOPOL 4.7 W	1.00
2 NW ROSELAND	1.00	1 N SEBASTOPOL	0.98
N SIDE OF MILL VALLEY	0.98	KENTFIELD	0.98
6 NE DAY VALLEY	0.94	DRY CRK FIRE STN	0.91
NOVATO 4.8 WNW	0.86	LOS GATOS 9.6 SSE	0.84
BROOKDALE	0.83	MT. UMUNHUM	0.83
REDWOOD@MT VEEDER	0.83	LA HONDA RAWS	0.83
SPRING VALLEY RAWS	0.82	FELTON	0.80
WINDSOR 1.5 WNW	0.79	FAIRFAX	0.79

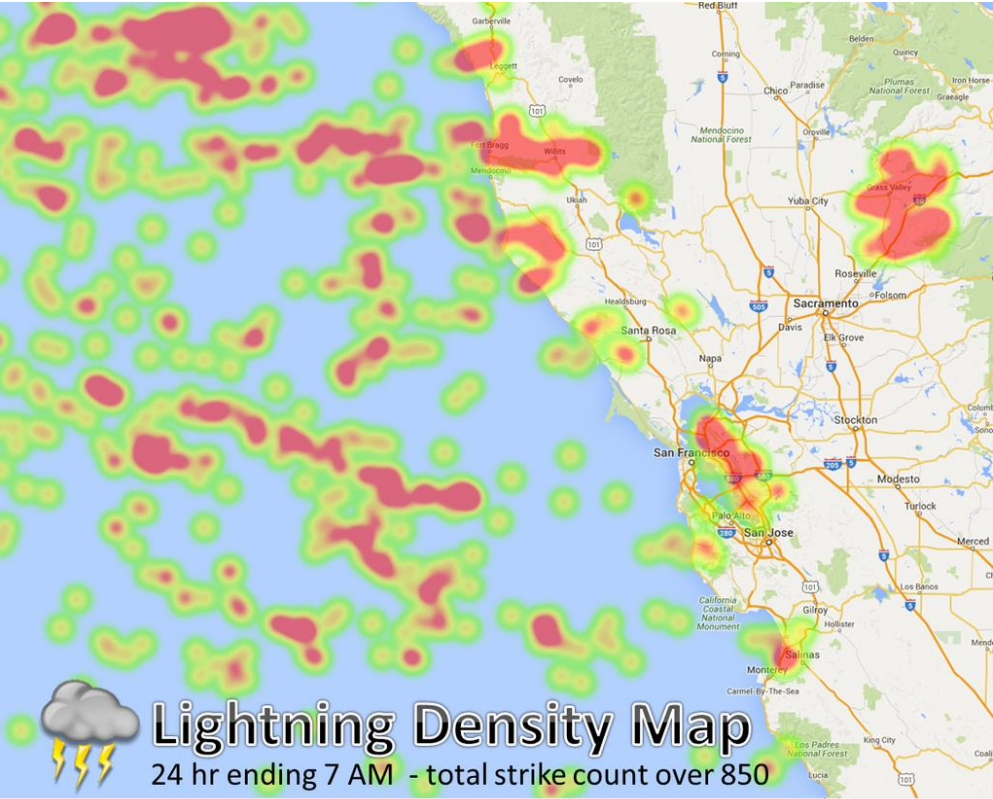
data valid as of Thu 2:29 pm

**Some 24 hour rain totals across the San Francisco Bay Area as of 2:30 pm on Thursday, December 10.**

Showers and isolated thunderstorms continued into the early morning hours of Friday, December 11.



**KMUX radar image at 3:30 am on Friday, December 11 showing a line of showers and isolated thunderstorms stretching from western Contra Costa County southwest through San Mateo County.**



**Lightning density map showing where thunderstorms occurred over the coastal waters and locally inland from Thursday, December 10 through the morning of Friday, December 11, 2015.**



Rainfall totals from late on December 9 through the morning of December 11 ranged from 0.25"-1.00" at most lower elevation locations. In the hills rain totals generally ranged from 1 to 3 inches. More than 3 inches fell in at a few locations in northwest Sonoma County.

The second large wave event of December occurred on December 10 and 11. Peak wave heights at coastal buoys from Point Arena south to Point Sur occurred between 7 pm and midnight on the evening of December 10, but very large waves continued to break along the coast through the following day. Peak swell heights recorded at coastal buoys ranged from 24 to 33 feet. An offshore buoy 250 miles west of San Francisco reported a peak swell height of 35 feet. The 30 foot swell recorded by the Monterey Bay Buoy at 11 pm on December 10 fell short of the record swell height at that buoy which is 32 feet set on January 5, 2008.



*Peak swell heights and time of peak value on December 10, 2015.*



Carmel Beach - Carmel, CA Photo M. Hirst

***Carmel Beach completely inundated by wave run-up from large swell that were breaking along the northern and central California coast on Friday, December 11.***



***A large breaking wave on Monterey Bay sends water spraying across Ocean View Boulevard in Pacific Grove on the morning of December 11. Photo: Vern Fisher, Monterey Herald.***



A cold storm system dropped south out of the Gulf of Alaska on Sunday, December 13 generating a period of heavy rain and associated minor urban flooding that morning. Showers with small hail followed in the afternoon. Hail was reported in San Francisco (Bernal Heights), Half Moon Bay, Menlo Park, and Pacifica. Rainfall totals on the 13<sup>th</sup> ranged anywhere from a quarter of an inch to an inch and a half. But this storm's biggest impact was strong winds which brought down trees and resulted in power outages. Nearly 15,000 power outages were reported by PG&E on the 13<sup>th</sup>. Several locations in the hills and near the coast reported peak wind gusts of between 40 and 50 mph on the morning of December 13. A few locations in the hills reported peak gusts of 55 mph, as did Ocean Beach in San Francisco.



***A large tree falls on a car and a home in San Pablo on December 13. Photo: KGO-TV***



***A tree fell on three vehicles in front of the Woodland Park Apartments in East Palo Alto on December 13. Photo: KGO-TV***





***A tree fell on a van in Hayward on December 13. Photo: @svqujournalist/Twitter***



***A large tree limb fell on a car in Aptos on Sunday, December 13. Photo: Tarmo Hannula***

The windy storm system that blasted through on December 13 brought with it a cold airmass which resulted in cool weather for a few days thereafter, including some frosty mornings. Early morning low temperatures on December 15 and 16 were near freezing in the interior valleys throughout the region. Near freezing low temperatures continued into December 17 in the interior valleys of Monterey and San Benito counties.



The next storm system brought light to moderate amounts of rain to the region on Friday and Saturday, December 18 and 19, with the North Bay once again seeing the highest amounts. North Bay locations near sea level picked up anywhere from 0.30" to 1.25", while higher elevations accumulated 0.50" to 2.50". South of the Golden Gate rain totals ranged from just a few hundredths to as much as an inch of rain.

A couple of robust weather systems tracked across the region from Sunday, December 20 through early on Tuesday, December 22. December 21<sup>st</sup> was the wettest day of the month at most climate stations. Storm total rainfall amounts in the North Bay from December 20 through the morning of December 22 ranged from 1 to 3 inches at lower elevations and from 2.5 to 8 inches in the hills. Elsewhere in the San Francisco Bay Area rain totals ranged from 0.50 to 2.50 inches at lower elevations, except less than a half inch in portions of the Santa Clara Valley, and from 2 to 4 inches in the hills except locally up to 7 inches in the Santa Cruz Mountains. From Monterey Bay south rain totals varied considerably, from less than a quarter of an inch in some inland valleys to as much as 6 inches in the Santa Lucia Mountains. Below is a sampling of storm total rainfall from December 20-22:

Location	County	Rainfall (inches)
Middle Peak (Mt. Tamalpais)	Marin	8.56
Cazadero	Sonoma	7.78
Ben Lomond	Santa Cruz	7.33
Pico Blanco	Monterey	6.42
Venado	Sonoma	5.28
Mount Saint Helena	Napa	4.33
La Honda	San Mateo	3.55
Kentfield	Marin	2.75
San Francisco Downtown	San Francisco	2.53
Oakland Museum	Alameda	2.14
Danville	Contra Costa	2.05
Sonoma County Airport	Sonoma	1.98
Watsonville Airport	Santa Cruz	1.95
Napa County Airport	Napa	1.58
Monterey NWS	Monterey	0.85
Pinnacles National Park	San Benito	0.76
San Jose Airport	Santa Clara	0.61

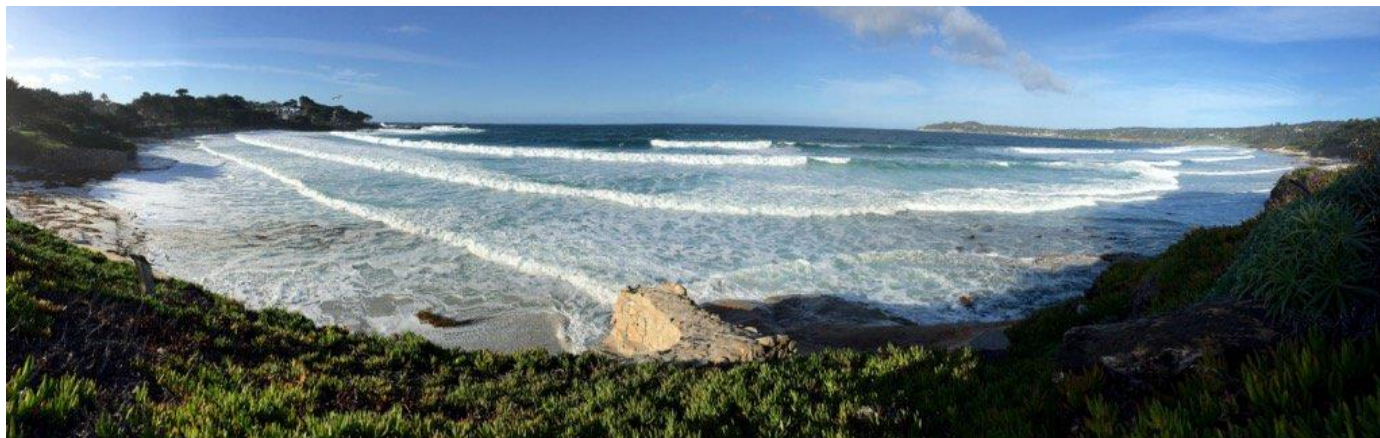
Strong and gusty west to northwest winds developed behind the departing weather system during the early morning hours of Tuesday, December 22. Wind gusts of between 40 and 50 mph were common, especially along the coast and in the hills, and local wind gusts in excess of 60 mph occurred in the North Bay Mountains. Thousands of power outages were reported due to these strong winds.

24 Hour Peak Wind Observations (mph)			
BIG ROCK RAWS	SW 71	ATLAS PEAK	SW 62
LAS TRAMPAS	W 55	SAN FRANCISCO ARPT	W 51
BENICIA BRIDGE	W 51	SPRING VALLEY RAWS	SW 50
ALTAMONT RAWS	SW 50	CALAVERAS RD RAWS	W 49
MARINERS POINT SAN	W 48	PT BLUNT ANGEL ISLAND	W 48
OCEAN BEACH	NW 47	OAKLAND ARPT	W 46
PETALUMA MUNICIPAL	W 44	EMERALD LAKE HILLS	NW 44
CASTLE ROCK RIDGE	SW 43	WEST SIDE LOS ALTOS	SW 43
BLACK DIAMOND RAWS	W 43	2 SSE SAUSALITO	W 43
ANITA ROCK SAN	SW 42	COYOTE PT	SW 42
ALAMEDA MARINA	W 42	PULGAS RAWS	W 41
CARQUINEZ STRAIT	W 41	NOVATO ARPT	W 41
PATTERSON PASS ROAD	W 40	ROSE PEAK	W 40
BARNABY RAWS	NW 40	1 N SAN MATEO	SW 40
5 E COLLINSVILLE	W 40	SAN LEANDRO MARINA	SW 40
NOVATO - OHAIR PARK	N 40	ALAMEDA POINT	SW 40
BRIONES RAWS	SW 39	HAYWARD MEMORIAL PARK	W 39
HAWKEYE RAWS	NW 39	1 W LOS ALTOS HILLS	SW 39
TREASURE ISLAND	SW 39	NAPA COUNTY ARPT	W 38
BUOY 26	W 38	OAKLAND OUTER HARBOR	W 38
PINNACLES RAWS	W 38	SWISS CREEK NR STEVENS	N 38
MARINERS POINT	W 38	BUOY 13	W 38
RICHMOND - BRICKYARD	W 38	CORTE MADERA	W 38
LIVERMORE ARPT	W 38	MALLORY RIDGE RAWS	W 38

data valid as of Tue 7:28 am - NWS San Francisco

***List of peak wind gusts on Tuesday, December 22.***

King tides, which are the highest tides of the year, occur when the Earth, Moon and Sun are aligned at perigee and perihelion. They typically occur near the winter solstice. A king tide event occurred on Wednesday, December 23.



***Carmel Beach during the "King Tide" on December 23, 2015. Photo: Steve Anderson***



A cold weather system near the British Columbia coast dropped south into the western U.S. on Thursday, December 24. The system produced light amounts of precipitation with rain totals of less than a half inch. Snow levels dropped to about 2500 feet by evening. Snow was reported at an elevation of 2450 feet in the Santa Cruz Mountains at 7:30 pm on Christmas Eve and 3 inches of snow accumulated on Mount Saint Helena in Napa County.

The Christmas Eve system brought a cold airmass into the region and set the stage for several cold nights during the final week of December. Morning lows on Saturday, December 26 were near freezing across most inland areas, with some of the coldest valley locations dropping into the upper 20s. The following night was even colder. Morning lows on Sunday, December 27 were the coldest of the month at most climate stations. Widespread sub-freezing temperatures were observed inland with lows in the 20s and freezing temperatures extending all the way to the coast. Three record low temperatures occurred on the morning of the 27<sup>th</sup>. Downtown San Francisco had a low of 39. The last time the temperature dropped below 40 degrees in the City was more than 2 years ago, on December 9, 2013 when the low was 36.

One final cold weather system for December swept through the region on Monday, December 28, dropping light rain (less than a quarter of an inch) and resulting in morning lows that were near freezing across inland areas on the morning of December 29 and December 31.

## **December Regional Precipitation Summary**

Although there were several days of measurable rain in December (Downtown San Francisco reported measurable precipitation on 13 December days) most precipitation events involved only light to moderate amounts of rain. Only the storm system of December 20-21 generated heavy amounts of rain and was the only December precipitation event in which San Francisco picked up more than an inch of rain. Rain totals for the month were relatively close to the 30-year average at most climate stations. Roughly half of all climate stations picked up more than their December normal rainfall and half saw less. Higher elevation climate stations tended to fare better with both Mount Diablo and Mount Hamilton picking up more than 160 percent of normal.

## **December 2015 Rainfall compared to Normal**

<b>Location</b>	<b>December Rainfall</b>	<b>Normal Dec Rain</b>	<b>Percent of Normal</b>
<b>North Bay</b>			
Angwin	8.30	8.09	103
Calistoga	8.69	7.88	110
Cloverdale	10.32	8.45	122
Fort Ross	11.17	8.40	133
Kentfield	7.31	9.91	74
Muir Woods	11.94	7.40	161
Napa	4.53	5.23	87
Napa Airport	2.78	3.79	73
Occidental	15.03	11.57	130
Petaluma Airport	4.99	4.94	101
San Rafael	4.95	7.59	65
Sonoma County Airport	7.01	7.03	100
Sonoma	4.48	6.21	72
<b>San Francisco Peninsula</b>			
Half Moon Bay	5.16	5.28	98
Palo Alto	2.42	2.95	82
Redwood City	3.89	3.84	101
San Francisco Airport	3.37	4.03	84
San Francisco Downtown	5.18	4.56	114
<b>East Bay</b>			
Antioch	1.60	2.41	66
Berkeley	4.93	5.04	98
Concord	2.60	3.38	77
Concord Airport	2.04	3.14	65
Fremont	3.28	2.82	116
Hayward Airport	2.59	3.12	83
Livermore	2.55	2.58	99
Livermore Airport	2.56	2.68	96
Martinez	2.70	3.71	73
Mount Diablo Junction	7.20	4.39	164
Newark	2.24	2.56	88
Oakland	4.70	4.48	105
Oakland Airport	4.11	3.66	112
Richmond	5.03	4.61	109



<b>South Bay and Santa Cruz County</b>			
Ben Lomond	8.75	9.88	89
Gilroy	2.41	3.70	65
Los Gatos	1.69	4.01	42
Moffett Federal Airfield	1.93	2.56	75
Mount Hamilton	6.67	4.15	161
San Jose	2.23	2.61	85
Santa Cruz	6.43	5.68	113
Watsonville	4.99	4.25	117
Watsonville Airport	4.52	4.20	108
<b>Monterey and San Benito Counties</b>			
Big Sur Station	7.66	8.63	89
Carmel Valley	4.24	3.01	141
Hollister	1.91	2.13	90
King City	1.01	1.98	51
Monterey	4.22	3.41	124
Monterey Airport	3.56	2.34	152
Pinnacles National Park	3.43	2.78	123
Salinas	3.03	2.44	124
Salinas Airport	1.96	1.93	102

## December Regional Temperature Summary

Warm weather early in the month was offset by cold conditions near the middle and end of the month. The end result was that average temperatures for December were relatively close to normal.

## December 2015 Average Temperatures compared to Normal

Location	Average High	Normal High	Departure from Normal	Average Low	Normal Low	Departure from Normal
Sonoma County Airport	56.5	56.3	0.2	38.1	36.5	1.6
Napa Airport	56.5	55.6	0.9	35.6	36.0	-0.4
San Rafael	56.8	54.3	2.5	42.8	41.8	1.0
San Francisco Downtown	56.4	57.1	-0.7	46.9	46.1	0.8
San Francisco Airport	55.8	56.6	-0.8	45.2	44.6	0.6
Redwood City	57.6	58.1	-0.5	40.1	40.3	-0.2
Concord Airport	57.4	55.6	1.8	39.8	39.8	0.0
Oakland	59.8	58.3	1.5	44.8	44.7	0.1
Oakland Airport	56.7	56.4	0.3	41.4	41.5	-0.1
Livermore Airport	57.3	56.2	1.1	37.2	37.7	-0.5
Hayward Airport	57.3	57.5	-0.2	41.9	42.6	-0.7
Moffett Federal Airfield	57.6	58.9	-1.3	41.3	42.9	-1.6
San Jose	58.4	58.0	0.4	41.6	41.9	-0.3
Watsonville Airport	59.0	60.0	-1.0	38.5	39.7	-1.2
Monterey	57.1	57.8	-0.7	43.7	43.8	-0.1
Monterey Airport	58.5	60.5	-2.0	42.3	42.3	0.0
Salinas Airport	59.2	61.1	-1.9	39.0	40.8	-1.8

## **Daily High Temperature Records for December 2015**

Date	Location	Record Max Temp	Previous Record and Year
12/09	San Jose	71	71 in 1893

## **Daily Low Temperature Records for December 2015**

Date	Location	Record Min Temp	Previous Record and Year
12/27	Oakland Airport	30	31 in 1956
12/27	Moffett Federal Airfield	29	32 in 1976
12/27	Oakland Museum	35	35 in 1988



### Miscellaneous December Climate Information:

Monthly Ranks for Downtown San Francisco		
Average High Temperature	56.4 degrees	58 <sup>th</sup> coolest out of 141 years
Average Low Temperature	46.9 degrees	65 <sup>th</sup> warmest of 141 years
Average Temperature	51.7 degrees	65 <sup>th</sup> coolest out of 141 years
Precipitation	5.18 inches	53 <sup>rd</sup> wettest out of 166 years

Monthly Extremes for Select Locations			
Location	Max Temp: Warmest Day(s)	Min Temp: Coolest Day(s)	Precipitation: Wettest Day(s)
Sonoma County Airport	12/08	12/27	12/21
	63 degrees	27 degrees	1.16 inches
San Francisco	12/09	12/27	12/21
	64 degrees	39 degrees	1.30 inches
Livermore Airport	12/09	12/27	12/21
	69 degrees	26 degrees	0.51 inches
San Jose	12/09	12/27	12/21
	71 degrees	30 degrees	0.49 inches
Salinas Airport	12/09	12/26, 12/29, 12/30	12/11
	68 degrees	32 degrees	0.46 inches

**Note:** Climatological data included in this document is preliminary. For official certified climatological data please contact the National Climatic Data Center at 828-271-4800 or <http://www.ncdc.noaa.gov>.

Official values as determined at the above web site may take several months for authentication and publication.